SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E/B.Tech – (Common to ALL Branches)
Title of the paper: Engineering Mathematics - II
Semester: II Max.Marks: 80
Sub.Code: 3ET202A-4ET202A-5ET202A Time: 3 Hours
Date: 12-05-2009 Session: FN

PART - A (10 X 2 = 20)
Answer ALL the Questions

1. State the relation between the coefficients and roots of the equation $\sum_{R=0}^{n} a_R x^R = 0$ (where a_R real and x complex)

2. Find the condition that the cubic $x^3 - lx^2 + mx - n = 0$ should have its roots in semetric progression.

3. Define radius of curvature in Cartesion coordinates and its polar coordinates.

4. Define evolute and involute.

5. Find the particular integral of $(D^2 + 5D + 6)\, y = e^x$.

6. Let f(x) be the particular integral of $$\frac{d^3 y}{dx^3} + \frac{4\,dy}{dx} = \sin 2x \quad find \quad \lim_{x \to \frac{\pi}{2}} f(x).$$

7. State Kirchhoff laws.

8. Define strut and column.

9. Define solenoidal vector function and irrotational motion.

10. If $F(t) = \left(5t^2 - 3t\right)\vec{i} + 6t^3\vec{j} - 7t\vec{k}, then\ find \int_2^4 F(t)dt$

PART – B (5 x 12 = 60)

Answer All the Questions

11. Transform the equation x3 – 6x2 + 5x + 8 = 0 into another in which the second terms in missing .Hence find the equation of its squared differences.

(or)

12. If α,β,γ be the roots of $x^3 + px + q = 0$, show that
(a) $\alpha^5+\beta^5+\gamma^5 = 5\alpha\beta\gamma(\beta\gamma,+ \gamma\alpha + \alpha\beta)$
(b) $3 \in \alpha^2 \in \alpha^5 = \in \alpha^3 \in \alpha^4$.

13. Prove that the radius of curvature at any point of the asteroid $x^{\frac{2}{3}} + y^{\frac{2}{3}} = \alpha^{\frac{2}{3}}$ in three times the length of the perpendicular from the origin to the tangent at that point.

(or)

14. A test on a square base of side x, has its sides vertical of height y and the top in a regular pyramid of height h. Find using the Lagrange's method of undetermined multiplies, x and y in terms of h, if the canvas required for its construction in is he minimum for the test to have a given capacity.

15. (a) $(D^2 - 1)y = x \sin 3x + \cos x$

(b) Also find y when x = 0 and $\frac{dy}{dx} = 1\ at\ \ x = 0.$

(or)

16. The small oscillations of a certain system with two degrees of freedom are given by the equations
$D^2x + 3x - 2y = 0,$
$D^2x + D^2y - 3x + 5y = 0,$
If x = 0, y = 0, Dx = 3, Dy = 2 when t = 0,
find x and y when t = $\frac{1}{2}$

17. Show that the differential equation for the current i in an electric circuit containing an inductance L and a resistance R in series and acted on by an electromotive force E sin wt satisfies the equation $L \dfrac{di}{dt} + Ri = E \sin wt$

(or)

18. A cantilever beam of length and weighing w *lc*/unit is subject to a horizontal compressive force p applied at the free end. Taking the origin at the free end and y axis upwards, istablish the differential equation of the beam and hence find the maximum deflection

19. Using Stoke's theorem evaluate $\int_c$ [(x + y) dx + (2x – z) dy + (y + z) dz] where c is the boundary of the triangle with vertices (2, 0, 0), (0, 3, 0) and (0, 0, 6).

(or)

20. Verify Divergence theorem for $\vec{F} = \left(x^2 - yz\right) \vec{i} + \left(y^2 - 3x\right) \vec{j} + \left(z^2 - xy\right) \vec{k}$ taken over the rectangular parallelopiped $0 \le x \le a$, $0 \le y \le b$, $0 \le z \le c$.